

*REMARKS*

*The Pending Claims*

Claims 5, 9, and 10 are pending and are directed to a pressure-sensitive adhesive sheet comprising a release sheet. The release sheet comprises a copolymer of (i) ethylene and (ii) 1-hexene or 1-octene. The release sheet has a suitably reduced peeling strength from the pressure-sensitive adhesive layer as compared to conventional release sheets. The invention is predicated, at least in part, on the discovery that a release sheet having a suitable and practical peeling strength can be provided by adjusting the spin-spin relaxation time ( $T_2$ ) and the ratio of the amorphous region of the copolymer to specific ranges, or by adjusting the bearing ratio to a specific range.

*Amendments to the Claims*

The claims have been amended to point out more particularly and claim more distinctly the present invention. Claims 1-4 and 6-8 have been cancelled. Claims 5 and 9 have been amended to recite that the release sheet comprises a copolymer of (i) ethylene and (ii) 1-hexene or 1-octene, as supported by the specification at, for example, page 10, lines 15-34. Claim 10 is new and corresponds to the subject matter of original claim 2. Accordingly, no new matter has been introduced by way of these amendments.

*Summary of the Office Action*

Claims 1-4 and 6-8 have been rejected under 35 U.S.C. § 102(b) as allegedly anticipated by *Polymer Processing Technology*, Japan Polyolefins Co. Catalog, 2000 (reprinted from <http://www.jpa.co.jp>). Claims 1-9 have been rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over US 5,948,517 (Adamko et al.), JP 11-060634 (Yahiro), and US 4,713,273 (Freedman). The Office also has rejected claims 5 and 9 under 35 U.S.C. § 103(a) as allegedly unpatentable over the aforementioned *Polymer Processing Technology* reference in view of International Patent Application WO 99/14281 (Hennen). Reconsideration is hereby requested.

*Discussion of the Rejections under Section 102(b)*

The Office has rejected claims 1-4 and 6-8 under Section 102(b). These claims have been cancelled. As such, the anticipation rejection is believed to be moot.

*Discussion of the Rejections under Section 103(a)*

The Office has rejected the pending claims for allegedly defining obvious subject matter in view of several references. These rejections are traversed for the following reasons.

A. *US 5,948,517 (Adamko et al.), JP 11-060634 (Yahiro), and US 4,713,273 (Freedman)*

The Office contends that US 5,948,517 (“the ‘517 patent”) teaches or suggests all the elements of the pending claims, except the spin-spin relaxation time, the ratio of the amorphous region, and the bearing ratio. The Office alleges it would have been obvious to modify the composition of the copolymer described in the ‘517 patent in view of the disclosures of JP 11-060634 and US 4,713,273 to arrive at the claimed invention.

The ‘517 patent is directed to a release film having a small release force that is free of silicone. The release film comprises a linear ethylenic polymer with a density of 0.865 g/cc to 0.900 g/cc and a dispersion degree of less than 5.0, with exemplification of a copolymer of ethylene and  $\alpha$ -olefin. However, the linear ethylene polymer used for the release film exemplified in the ‘517 patent is an ethylene-butene-1 copolymer (see Table 1 of the ‘517 patent), whereas the pending claims require a copolymer of ethylene and 1-hexene or 1-octene, which is not exemplified in the ‘517 patent.

Moreover, even if one of ordinary skill in the art were motivated to replace the ethylene polymer exemplified in the ‘517 patent with an ethylene hexene-1 copolymer or ethylene-octene-1 copolymer to constitute a release sheet, and to use this release sheet in a pressure-sensitive adhesive sheet, the result would not necessarily be the present invention as defined by the pending claims. One ordinarily skilled in the art would have to not only use the above-mentioned copolymer for a release sheet, but also arrive at the technical idea to set the spin-spin relaxation time in an amorphous region and the ratio of the amorphous region of the copolymer to the ranges recited in pending claims 5 and 10 or to set the bearing ratio of the release sheet to the predetermined range set forth in pending claim 9. The importance of these other parameters is clear from the fact that the release sheet of Comparative Examples 1 to 3 of the present application did not exhibit a suitable release force (e.g., 50-3000 mN/50 mm), although ethylene-hexene-1 copolymer and ethylene-octene-1 copolymer were used inasmuch as the spin-spin relaxation time of the amorphous region of the copolymer, the ratio of the amorphous region of the copolymer, and the bearing ratio of the release sheet were outside the ranges recited in the pending claims (see Table 1 of the specification).

The Office contends that, while the ‘517 patent does not teach the parameters recited in the pending claims, it would have been obvious for one skilled in the art to modify the

composition and physical structure of the materials of the '517 patent to achieve the parameters recited in the pending claims. However, one skilled in the art would not easily envisage the relationship between the claimed parameters (e.g., spin-spin relaxation time and ratio of the copolymer and the bearing ratio of the release sheet) and the composition and physical structure of the copolymer, as well as control of the release force of a release sheet based on adjustment of these parameters, since the '517 patent does not teach or suggest such parameters.

Moreover, the Office contends that, because the ethylene polymer used in the '517 patent results from polymerization using a metallocene catalyst, a film obtained therefrom would have a uniform composition distribution and a small bearing ratio. However, as clearly stated in the present specification at page 8, line 18, through page 9, line 11, for the present invention, it is critical that the bearing ratio of the obtained release sheet be within the predetermined range, and too small a bearing ratio would not be useful in the context of the present invention. Thus, it is extremely unlikely that the present invention could be envisaged based solely on an assumption that the bearing ratio of the obtained film will become small under certain circumstances.

The disclosure of JP 11-060634 ("the '634 patent") does not remedy the deficiencies of the '517 patent. The '634 patent is directed to an ethylene polymer and an ethylene- $\alpha$ -olefin copolymer used for film, blow molding, and pipe (particularly pipe), which end-uses differ from the presently claimed pressure-sensitive adhesive sheet. The '634 patent exemplifies, as the Office has pointed out, copolymers with components recited in the pending claims; however, the copolymer specifically disclosed in the '634 patent is an ethylene-butene-1 copolymer (see Examples and Comparative Examples of the '634 patent), and not the copolymer of ethylene and 1-hexene or 1-octene that is recited in the pending claims.

The Office contends that it would be obvious for one skilled in the art to alter the amorphous portion spin-spin relaxation time and the amorphous region ratio of the ethylene polymer described in the '517 patent in consideration of the teaching of the '634 patent to make those parameters fall within the parameter ranges recited in the pending claims. However, as described above, the '517 patent does not even refer to an amorphous portion spin-spin relaxation time or an amorphous region ratio. Moreover, the disclosure of the '634 patent requires that the ratio of the spin-spin relaxation time  $T_{2a}$  ( $\mu$ s) of the amorphous region to the spin-spin relaxation time  $T_{2c}$  ( $\mu$ s) of the crystalline region ( $T_{2a}/T_{2c}$ ) of the copolymer is not more than 7.2  $\mu$ s at 40°C, which does not correspond to the requirement of the pending claims that the spin-spin relaxation time of proton in an amorphous region of the copolymer

of 130-350  $\mu$ s at 30°C. Thus, the '634 patent describes that a spin-spin relaxation time  $T_{2c}$  of a crystalline portion preferably is not more than 10  $\mu$ s (see paragraph [0013] of the '634 patent). Combined with a  $T_{2a}/T_{2c}$  at 40°C of not more than 7.2  $\mu$ s, the value of  $T_{2a}$  in the '634 patent would be smaller than 72  $\mu$ s. Considering that the pulse NMR is an "index of molecular mobility," the relaxation time generally becomes longer as the temperature of measurement becomes higher, and becomes shorter as the temperature of measurement becomes lower. The temperature of measurement of the spin-spin relaxation time is different between that recited in the pending claims and the '634 patent. Accordingly, if  $T_{2a}$  of the copolymer described in the '634 patent is measured at 30°C, it will be smaller than the value of 72  $\mu$ s at 40°C. Therefore, the  $T_{2a}$  at 30°C of the copolymer described in the '634 patent does not fall within the claimed range of 130-350  $\mu$ s at 30°C (e.g., as recited in pending claims 5 and 10).

Furthermore, the disclosure of US 4,713,273 ("the '273 patent") does not remedy the deficiencies of the '517 and '634 patents. The '273 patent strives to prevent the mixing of air bubbles during application of an adhesive by the use of a release liner having a specific surface roughness together with an adhesive layer, thereby to impart surface roughness to the adhesive layer during a forming step. The '273 patent teaches imparting specific surface roughness to a release liner. As the Office states, the '273 patent does not clearly indicate the bearing ratio of the release liner. As the Office has also pointed out, Applicants previously explained in the "Response to Office Action" dated September 26, 2003, that the surface roughness and bearing ratio of a release sheet are correlated with each other. However, one ordinarily skilled in the art who obtained a finding regarding surface roughness from the '273 patent would not necessarily connect the finding with the bearing ratio of a release sheet. There are various parameters other than bearing ratio that correlate with the surface roughness, and without the explanation of the correlation between the surface roughness and the bearing ratio or motivation to alter the bearing ratio in the manner necessary to arrive at the present invention, one ordinarily skilled in the art would not be able to arrive at the invention defined by the pending claims (e.g., claim 9) from these cited references.

Thus, the references do not teach or suggest a pressure-sensitive adhesive sheet comprising the release sheet, wherein the release sheet has a monolayer structure or a laminate structure, wherein the release sheet comprises a copolymer of (i) ethylene and (ii) 1-hexene or 1-octene, and wherein either (a) the copolymer has a spin-spin relaxation time ( $T_2$ ) of proton in an amorphous region of the copolymer of 130-350  $\mu$ s at 30°C, and a ratio of the amorphous region of the copolymer, as calculated from the spin-spin relaxation time ( $T_2$ ), of 7-17%, or (b) the release sheet has a bearing ratio of -30 to 15, as recited in the pending

claims. Therefore, the cited references cannot be considered to render unpatentable the present invention defined by the pending claims, and the rejection should be withdrawn.

B. *Polymer Processing Technology and WO 99/14281 (Hennen)*

The Office contends that the *Polymer Processing Technology* reference teaches a release sheet comprising an ethylene polymer, but does not teach a pressure-sensitive adhesive sheet comprising the release sheet. The Office contends that WO 99/14281 ("the '281 PCT") teaches the use of a release liner for a pressure sensitive adhesive and, therefore, that it would have been obvious for one skilled in the art to use the release liner of the *Polymer Processing Technology* reference for a pressure sensitive adhesive to provide a protective liner for the adhesive that is thermally stable, tear resistant, and exhibits no shrinking or buckling when exposed to various temperatures. Neither reference, however, discloses the present inventive adhesive sheet comprising a release sheet having a suitable release force.

Even if one skilled in the art were motivated by the disclosures of the *Polymer Processing Technology* reference and the '281 PCT to chose ethylene-hexene-1 copolymer and ethylene-octene-1 copolymer to constitute a release sheet and to use this release sheet in a pressure-sensitive adhesive sheet, the result would not necessarily be the present invention. One ordinarily skilled in the art would have to not only use the above-mentioned copolymer for a release sheet, but also arrive at the technical idea to set the spin-spin relaxation time in an amorphous region and the ratio of the amorphous region of the copolymer to the ranges recited in pending claims 5 and 10 or to set the bearing ratio of the release sheet to the predetermined range set forth in pending claim 9. The importance of these other parameters is clear from the fact that the release sheet of Comparative Examples 1 to 3 of the present application did not exhibit a suitable release force (e.g., 50-3000 mN/50 mm), although ethylene-hexene-1 copolymer and ethylene-octene-1 copolymer were used inasmuch as the spin-spin relaxation time of the amorphous region of the copolymer, the ratio of the amorphous region of the copolymer, and the bearing ratio of the release sheet were outside the ranges recited in the pending claims (see Table 1 of the specification).

Furthermore, one skilled in the art would not easily envisage the relationship between the claimed parameters (e.g., spin-spin relaxation time and ratio of the copolymer and the bearing ratio of the release sheet) and the composition and physical structure of the copolymer recited in the *Polymer Processing Technology* reference and the '281 PCT, as well as control of the release force of a release sheet based on adjustment of these parameters, since the cited references do not teach or suggest such parameters.

Thus, the references do not teach or suggest a pressure-sensitive adhesive sheet comprising the release sheet, wherein the release sheet has a monolayer structure or a laminate structure, wherein the release sheet comprises a copolymer of (i) ethylene and (ii) 1-hexene or 1-octene, and wherein either (a) the copolymer has a spin-spin relaxation time ( $T_2$ ) of proton in an amorphous region of the copolymer of 130-350  $\mu$ s at 30°C, and a ratio of the amorphous region of the copolymer, as calculated from the spin-spin relaxation time ( $T_2$ ), of 7-17%, or (b) the release sheet has a bearing ratio of -30 to 15, as recited in the pending claims. Therefore, the cited references cannot be considered to render unpatentable the present invention defined by the pending claims, and the rejection should be withdrawn.

*Conclusion*

The application is considered to be in good and proper form for allowance, and the Examiner is respectfully requested to pass this application to issue. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,



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